IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

---ooo:O:ooo---

In re Application of

Tadashi Ishida, et al.   Group Art Unit: 1794

Application No. 10/522,416   Examiner: BETELHEM SHEWAREGED

Filed: January 26, 2005

For: INK JET RECORDING MEDIUM

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

DECLARATION UNDER 37 CFR 1.132

I, Masaya KUSUMOTO, declare and state that:

1. In March, 1990, I was graduated from Hokkaido Asahikawa Technical High-School.

Since April, 1990, I have been an employee of MITSUI Chemicals, INC., and till the present time, I have been engaged in development work in emulsion for thermosensitive recording material and for ink jet recording material.

2. I am a co-inventor of the invention described in the specification of the above-identified application.

3. I calculated SP (solubility parameter) values, d, of polymers prepared in Experiments I, II and III in the declaration of December 3, 2007, by Fedors method as a guide of water solubility.

1

(1) The procedure for calculating SP value according to Fedors method is as follows.

<Calculation of SP value of homopolymer>

$$d = (\Delta E/V)^{1/2} = (S\Delta ei/S\Delta vi)^{1/2}$$

ΔE: Cohesive energy density

V: Molar volume

Δei: Evaporation energy of atomic group

Δvi: Molar volume of atomic group

When Tg of polymer is not less than 25°C and n is less than 3, the following constant (i) is added to Δvi.

When Tg of polymer is not less than 25°C and n is not less than 3, the following constant (ii) is added to Δvi.

(i)   4n

(ii)   2n

n: Number of main-chain skeletal atom in a minimum repeating unit of polymer

<Calculation of SP value of copolymer>

$$d = (da*da + db*db + dc*dc ....)/100$$

da, db, dc ...: Volume % of monomer

da, db, dc ...: SP value of homopolymer

(2) According to the above procedure, SP values of homopolymers formed from monomers used in Experiments I, II and III were calculated. The results are shown in Table 1.

2

Table 1

Monomer	Atomic group		Δei		Δvi		Homopolymer	
	Type	Number (a)	(b)	(a)*(b)	(c)	(a)*(c)	Tg [°C]	SP [cal/cm³]
Methacrylic acid CH_2CCH_3COOH (density: 1.055)	CH_2	1	1180	1180	16.1	16.1	185	11.76
	CH_3	1	1125	1125	33.5	33.5		
	C	1	350	350	−19.2	−19.2		
	COOH	1	6600	6600	28.5	28.5		
	4n (n=2)					8		
	total			9255		66.9		
Dimethylaminopropyl methacrylamide CH_2CCH_3CONH $CH_2CH_2CH_2NCH_3CH_3$ (density: 0.9419)	CH_2	4	1180	4720	16.1	64.4	96	10.64
	CH_3	3	1125	3375	33.5	100.5		
	C	1	350	350	−19.2	−19.2		
	CONH	1	8000	8000	9.5	9.5		
	N	1	1000	1000	−9	−9		
	4n (n=2)					8		
	total			17445		154.2		
2-Hydroxyethyl methacrylate CH_2CCH_3COO CH_2CH_2OH (density: 1.072)	CH_2	3	1180	3540	16.1	48.3	80	11.96
	CH_3	1	1125	1125	33.5	33.5		
	C	1	350	350	−19.2	−19.2		
	COO	1	4300	4300	18	18		
	OH	1	5220	5220	13	13		
	4n (n=2)					8		
	total			14535		101.6		
Methacrylamide $CH_2CCH_3CONH_2$ (density: 1.11)	CH_2	1	1180	1180	16.1	16.1	256	15.05
	CH_3	1	1125	1125	33.5	33.5		
	C	1	350	350	−19.2	−19.2		
	$CONH_2$	1	10000	10000	17.5	17.5		
	4n (n=2)					8		
	total			12655		55.9		
Styrene $CH_2CHC_6H_5$ (density: 0.9048)	CH_2	1	1180	1180	16.1	16.1	104	10.09
	CH	1	820	820	−1	−1		
	C_6H_5	1	7630	7630	71.4	71.4		
	4n (n=2)					8		
	total			9630		94.5		
t-Butylmethacrylate CH_2CCH_3COO $CCH_3CH_3CH_3$ (density: 0.874)	CH_2	1	1180	1180	16.1	16.1	107	8.81
	CH_3	4	1125	4500	33.5	134		
	C	2	350	700	−19.2	−38.4		
	COO	1	4300	4300	18	18		
	4n (n=2)					8		
	total			10680		137.7		

3

(3) According to the above procedure, SP values of copolymers prepared in Experiments I, II and III were calculated.

[Experiment I]

Volume % of monomers used in Experiment I is shown in Table 2.

Table 2

Reagent Name	% mol	% wt	% vol
Methacrylic Acid	9.662	6.24	6.04
Dimethylaminopropyl Methacrylamide	30.00	35.16	38.13
2-Hydroxyethyl Methacrylate	60.00	58.60	55.83
Trimethylolpropane Trimethacrylate	0.300		
Polymerization initiator	0.038		
Total (Polymer)	100	100	100

Trimethylolpropane trimethacrylate is eliminated from calculation because of low amount.

From Tables 1 and 2, SP value, d, of the copolymer prepared in Experiment I is calculated as follows.

$$d = \{(6.04*11.76)+(38.13*10.64)+(55.83*11.96)\}/100$$

$$= \mathbf{11.44} \ [cal/cm^3]$$

[Experiment II]

Volume % of monomers used in Experiment II is shown in Table 3.

Table 3

Reagent Name	% mol	% wt	% vol
Methacrylamide	74.362	64.04	60.49
Dimethylaminopropyl Methacrylamide	20.00	31.61	35.19
Methacrylic Acid	5.00	4.35	4.32
Methylene Bisacrylamide	0.60		
Polymerization initiator	0.038		
Total (Polymer)	100	100	100

Methylene bisacrylamide is eliminated from calculation because of low amount.

4

From Tables 1 and 3, SP value, d, of copolymer prepared in Experiment II is calculated as follows.

$$d = \{(60.49 * 15.05) + (35.19 * 10.64) + (4.32 * 11.76)\}/100$$

$$= \mathbf{13.36} \ [cal/cm^3]$$

[Experiment III]

Volume % of monomers used in Experiment III is shown in Table 4.

Table 4

Reagent Name	% mol	% wt	% vol
Styrene	45.35	39.40	39.68
t-Butyl Methacrylate	38.33	45.45	47.38
2-Hydroxyethyl Methacrylate	9.31	10.10	8.58
Methacrylic acid	7.01	5.05	4.36
Polymerization initiator		0.30	
Total Solids	100	100	100

From Tables 1 and 4, SP value, d, of copolymer prepared in Experiment III is calculated as follows.

$$d = \{(39.68 * 10.09) + (47.38 * 8.81) + (8.58 * 11.96)$$
$$+ (5.05 * 11.76)\}/100$$

$$= \mathbf{9.80} \ [cal/cm^3]$$

4. From the above results of SP values calculated by Fedors method, SP value of the copolymer of the present invention is lower than that of copolymers of US6,361,768. I think that the difference of water solubility between the copolymer of the present invention and the copolymer of US6,361,768 is attributed to SP value.

5

In addition, copolymers of US6,361,768 comprise a non-ionic hydrophilic monomer such as 2-hydroxyethyl methacrylate and methacrylamide at a high concentration (35-95 mole percent). On the other hand, the copolymer of the present invention comprises a non-ionic hydrophilic monomer at a low concentration (9.31 mole % in Experiment III). I think that the difference of SP value between the copolymer of the present invention and the copolymer of US6,361,768 is attributed to the content of a non-ionic hydrophilic monomer.

Therefore, I believe that the hydrophilic ampholytic polymers of US6,361,768 can not be dispersed in water in the state of particle because a non-ionic hydrophilic monomer is at a high concentration.

The undersigned declares further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

Masaya Kusumoto
Masaya KUSUMOTO

Date: September 5, 2008